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Langley Research Center
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Chris Rink
Langley Research Center, Hampton, Va.
(Phone: 757/864-6786)

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NASA KNOW-HOW WILL REDUCE AUTOMOTIVE EMISSIONS

NASA's laser technology may soon be part of your car's exhaust system. Originally designed for satellites to measure the chemical makeup of the Earth's atmosphere, Low-Temperature Oxidation Catalysts (LTOC) will soon be available for commercial use.

Developed at NASA's Langley Research Center in Hampton, Va., LTOC technology is expected to reduce automotive pollution emissions by approximately 30 percent and the cost of after-market catalytic converters by 25 percent.

Most modern automobiles are equipped with catalytic converters that treat engine exhaust before it leaves the car. Current technology requires the exhaust to reach a high temperature before the catalytic converter begins to work.

According to Dr. Jeff Jordan, the LTOC team lead at Langley, LTOC begins to operate at a much lower temperature or as soon as the car is started.

"NASA's LTOC addresses some of the shortcomings of conventional catalysts that we refer to as the cold start deficiency," Jordan said. "When you first start your car in the morning, particularly if you live in colder areas of the United States, your catalytic converter is cold and all the pollutants coming from your engine are going directly through your tailpipe into the environment," he explained.

Each of the millions of cars in the United States is potentially a source of air pollution. In larger urban areas, greater numbers of cars produce more emissions and pollution-related health and environmental problems. Because of its low-temperature oxidation capabilities, the NASA catalyst begins to work almost immediately enabling destruction of toxic gases even when the catalytic converter is cold.

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"If you think about cold cars starting billions of times a day, a great deal of pollution could be reduced through the implementation of NASA's LTOC," Jordan added.

Most cars are equipped with three-way catalytic converters. "Three-way" refers to three regulated emissions: carbon monoxide, an odorless and colorless poisonous gas; hydrocarbons or volatile organic compounds (VOCs) produced from evaporated unburned fuel; and nitrogen oxides, called "NOx." The latter two contribute to smog and acid rain.

"The LTOC is a collection of technologies that enables the destruction of pollutant gasses such as carbon monoxide and hydrocarbons as well as NOx species," Jordan said.

To maintain carbon dioxide lasers in space for atmospheric research, NASA needed a catalyst system that would affect the oxidation of carbon monoxide, a by-product of carbon-dioxide laser operation, under the cold vacuum of space. NASA called on Langley researchers to develop a technology for space-based carbon-dioxide laser systems.

Although the need for a carbon dioxide laser in space gave way to solid-state lasers, the NASA research team developed an oxidation technology that would work at very low temperatures. Part of the challenge, to adapt LTOC for internal combustion applications, was to make it effective at high engine exhaust temperatures. The result was a catalyst that meets initial Environmental Protection Agency requirements and California emission standards for the automotive after-market, does not require a warm-up period to function, and uses significantly less precious metals than current commercial products, which reduces the overall cost of the converter.

"The original NASA LTOC is a unique technology that was developed for a space-based function," said Jordan. "But it has been further developed for a ground-based application that will improve air quality by significantly reducing automobile emissions at lower costs."

Through NASA's technology commercialization program, Airflow Catalyst Systems Inc., Rochester, N.Y., is the exclusive licensee for the NASA LTOC internal combustion application. Airflow officials expect to have a product on the market within the next 12 months.

NASA is still accepting licensing applications for other LTOC technologies including: sensors for carbon monoxide or volatile organic compounds; removal of carbon monoxide and formaldehyde from houses and other buildings; and removal of carbon monoxide and formaldehyde from automobile, aircraft and other vehicle interiors.